

7.0 Green River, Utah, Disposal Site

7.1 Compliance Summary

The Green River, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on May 20, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors did not identify any maintenance items or concerns that required a follow-up or contingency inspection.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts annual groundwater monitoring to track disposal cell performance in accordance with the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1998). Groundwater monitoring was last completed in May 2020. The UMTRCA maximum concentration limits (MCLs), which the LTSP specified as the groundwater standards for the site, were exceeded at multiple point-of-compliance (POC) wells. In 2011, LM developed a draft Groundwater Compliance Action Plan (GCAP) to update the groundwater monitoring requirements (DOE 2011) as specified in the LTSP. The draft GCAP has been approved by the State of Utah but had not been accepted at the time of this report's publication by the U.S. Nuclear Regulatory Commission (NRC). LM received a request for additional information (RAI) from NRC and is addressing the commission's comments. Groundwater analytical results presented here are evaluated with respect to LTSP requirements until the GCAP is finalized.

7.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the LTSP and in accordance with procedures established to comply with the requirements of the NRC general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 7-1 lists these requirements.

Table 7-1. License Requirements for the Green River, Utah, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 7.4	(b)(3)
Follow-Up or Contingency Inspections	Section 7.0	Section 7.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 7.6	(b)(5)
Groundwater Monitoring	Section 5.2	Section 7.7	(b)(2)
Corrective Action	Section 9.0	Section 7.8	--

7.3 Institutional Controls

The 25-acre site, identified by the property boundary shown in Figure 7-1, is owned by the United States and was accepted under the NRC general license in 1998. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, is responsible for the custody and long-term care of the site. Institutional controls (ICs) at the site include federal ownership of the property, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gate and sign, security fence around

the disposal cell, perimeter signs, site markers, survey and boundary monuments, and wellhead protectors.

7.4 Inspection Results

The site, 1 mile southeast of Green River, Utah, was inspected on May 20, 2020. The inspection was conducted by S. Hall and P. Lemke of the Legacy Management Support (LMS) contractor. A. Denny (LM site manager), H. Mickelson (State of Utah representative), and J. Carman and A. Farinacci of the LMS contractor attended the inspection. The purposes of the inspection were to confirm the integrity of visible features at the site, identify changes in conditions that might affect conformance with the LTSP, and evaluate the need, if any, for maintenance or additional inspection and monitoring.

7.4.1 Site Surveillance Features

Figure 7-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue, and new observations identified during the 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are described in the following subsections. Photographs to support specific observations are identified in the text and in Figure 7-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 7.10.

7.4.1.1 Access Road, Entrance Gate, and Entrance Sign

Access to the site is either from U.S. Highway 6 and 50 heading east from the town of Green River or from U.S. Interstate 70 via Street 1600 East. The paved access road crosses property owned by the State of Utah and the U.S. Army. Access has been granted to LM through right-of-way agreements with both entities. Entrance to the site is through a locked steel gate in the paved road right-of-way fence; LM does not own the gate or the right-of-way fence. Past this gate, a dirt road leads across State land to the site. The access road divides at the security fence, with one branch entering the security fence that encloses the disposal cell and the other providing access around the outside of the security fence. The entrance sign is next to the access road where it enters the site (PL-1). No maintenance needs were identified.

7.4.1.2 Security Fence and Perimeter Signs

A chainlink security fence encloses the portion of the site that contains the disposal cell. Two vehicle gates are at the south and east corners of the security fence line, and a personnel gate is at the north corner of the security fence line. The security fence (PL-2) was intact, and the gates were locked. The minor erosion under the southeast fence line identified and repaired during the 2019 inspection remains stable.

There are 17 perimeter signs (PL-3), attached to steel posts set in concrete, positioned along the unfenced property boundary. Two new unmanned aircraft system (UAS) warning signs will be installed before the next inspection. No maintenance needs were identified.

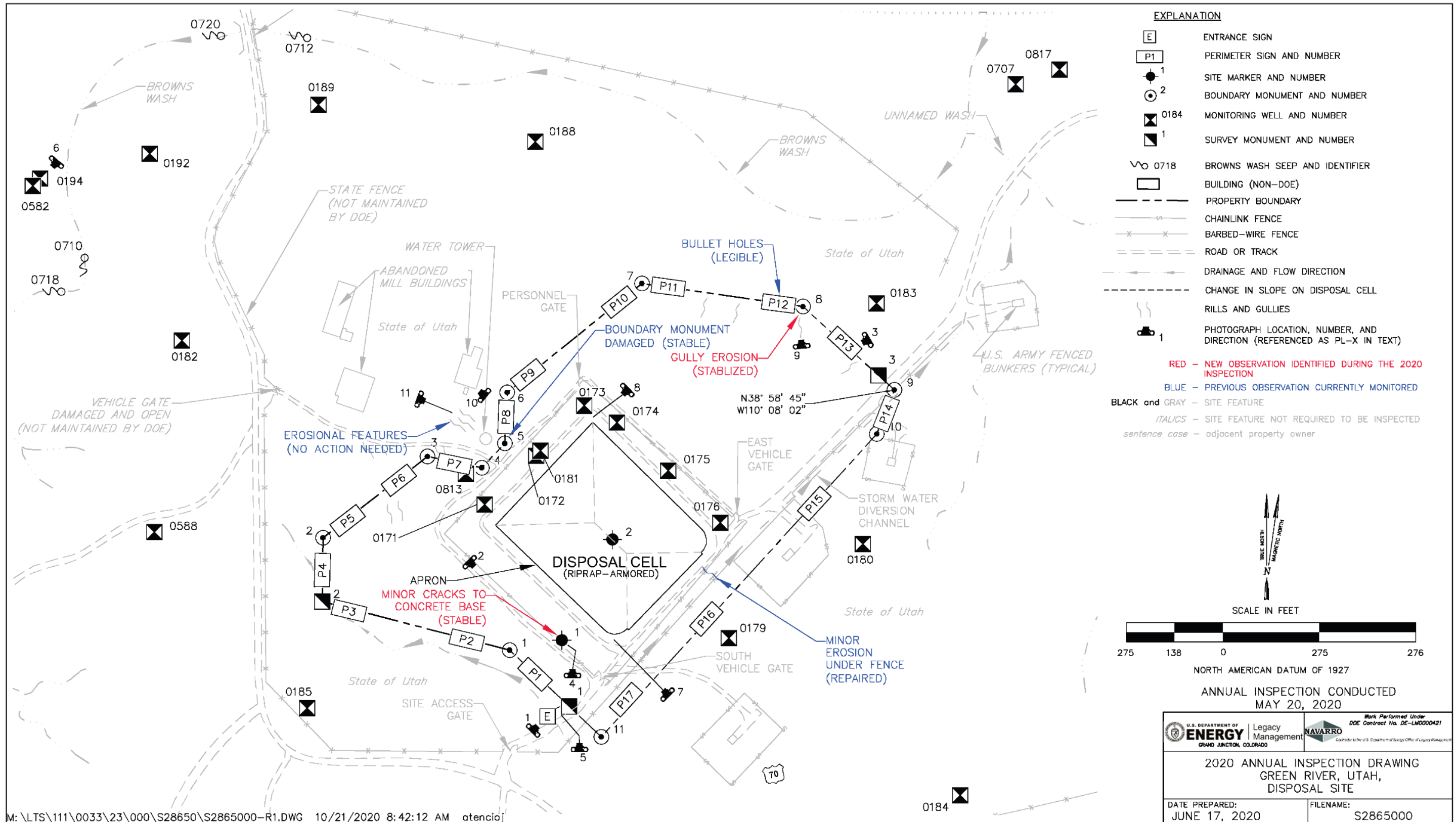


Figure 7-1. 2020 Annual Inspection Drawing for the Green River, Utah, Disposal Site

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7.4.1.3 Site Markers

The site has two granite markers. Site marker SMK-1 is inside the security fence near the southwest corner of the site (PL-4), and SMK-2 is on the crest of the disposal cell. The concrete base of SMK-1 has several minor cracks, but they do not compromise the integrity of the base, and repairs are not necessary at this time. No maintenance needs were identified.

7.4.1.4 Survey and Boundary Monuments

Eleven boundary monuments and three survey monuments (PL-5) delineate the property boundary. Boundary monument BM-5 is damaged (it is bent from being hit by a vehicle), but its condition does not require repair. No maintenance needs were identified.

7.4.1.5 Aerial Survey Quality Control Monuments

Aerial survey quality control monuments are planned to be installed in fiscal year 2021.

7.4.1.6 Monitoring Wells

There are 22 monitoring wells on or near the site. Monitoring wells were inspected during the May 2020 sampling event. All wellhead protectors observed during the inspection were undamaged and locked (PL-6). Some of the concrete monitoring well collars are cracked, but the wellhead protectors are stable and repairs are not necessary. No maintenance needs were identified.

7.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell and adjacent area inside the security fence, (2) the site perimeter between the security fence and the site boundary, and (3) the outlying area. Inspectors examined specific site surveillance features within each area and looked for evidence of settlement, erosion, or other modifying processes that might affect the site's conformance with LTSP requirements.

7.4.2.1 Disposal Cell and Adjacent Area Inside the Security Fence

The disposal cell, completed in 1989, occupies 6 acres. The slopes of the disposal cell cover are armored with riprap, consisting primarily of competent basalt with a small fraction of sedimentary rocks, to control erosion (PL-7). A small percentage of the rock, including basalt and sedimentary rock, has degraded, but the riprap cover is functioning as designed. There was no evidence of settling, slumping, erosion, or any other modifying process that might affect the integrity of the disposal cell.

A boulder-filled trench, known as an apron, surrounds the disposal cell (PL-8). The apron was intact and stable, with no observed erosion along the base of the side slopes. Small erosion rills are present along portions of the outside edge of the apron. The rills form as stormwater runoff along the disposal cell perimeter road drains into the disposal cell apron. This occurrence is not a concern, because the erosion is minor and sedimentation in the apron has not adversely affected the performance of the apron (the sediment has not filled the apron or become visible in the apron). Inspectors will continue to monitor the area.

The area between the disposal cell and the security fence consists of the disposal cell perimeter dirt road, several monitoring wells, and sparsely vegetated open space. The road was passable, and there was no indication of erosion or trespassing in the open space. No maintenance needs were identified.

7.4.2.2 Perimeter Area In-Between the Security Fence and the Site Boundary

The area between the security fence and the site boundary is primarily open space but includes access roads, a stormwater diversion channel, and monitoring wells. The property boundary of the site is not fenced, and trespassing occurs on the site from several access points through State of Utah land. Unauthorized access to the site is primarily from the west through a former mill access gate that has broken off its hinges; LM is not responsible for the gate or associated fence. The site is also accessible through remote, unfenced, open-access points north and east of the site. The site will continue to be monitored for adverse public use typically indicated by trash, tire ruts, and vandalism. Inspectors did not find any indication of vandalism during this inspection.

Signs of erosion appear in multiple areas in the site perimeter. Erosional rills are present on the west side of the site but are not affecting any site surveillance features. Rills and gullies are also present along the escarpment northeast of the disposal cell in the area between boundary monument BM-7 and survey monument SM-3 (approximately 400 feet [ft] from the base of the disposal cell) (PL-9). Maximum gully depth in this area is approximately 3 ft, but the erosion appears to be stabilizing. A portion of the stormwater diversion channel along the southeast side of the site continues to erode slowly. These erosional features could eventually damage site surveillance features (i.e., perimeter signs, boundary monuments, and the security fence). The closest erosional features are approximately 300 ft from the disposal cell and do not pose a risk to the integrity of the disposal cell. Inspectors will continue to monitor this area. No immediate maintenance needs were identified.

7.4.2.3 Outlying Area

The area beyond the site boundary for a distance of 0.25 mile was visually observed for erosion, changes in land use, or other phenomena that might affect the long-term integrity of the site. No such impacts were observed. Abandoned buildings and a water tower associated with the former milling activities are northwest of the site (PL-10). The buildings are not maintained and are in disrepair, and debris tends to blow onto the site from surrounding buildings (e.g., shingles, siding, plastic). Accumulation of windblown debris is minor but will continue to be monitored and removed.

Areas of erosion noted during previous inspections include the natural drainage near the southwest side of the site and rills and gullies northwest of the water tower (PL-11). Evidence of continued erosion in these areas was apparent but does not threaten the integrity of the disposal cell or site surveillance features. Inspectors will continue to monitor these erosional features. No maintenance needs were identified.

7.5 Follow-Up or Contingency Inspections

LM will conduct follow-up or contingency inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition or (2) LM is notified by a citizen or outside agency that conditions at the site are substantially changed. No need for a follow-up or contingency inspection was identified.

7.6 Maintenance and Repairs

No maintenance needs were identified at the time of the inspection. Two new UAS warning signs will be installed before the next inspection.

7.7 Groundwater Monitoring

In accordance with the LTSP, annual groundwater monitoring is conducted to evaluate the performance of the disposal cell. In 2011, LM developed a draft GCAP that was approved by the State of Utah. As a best management practice, LM implemented the draft GCAP to expand the groundwater monitoring requirements (i.e., additional monitoring wells and analytes) and propose a groundwater compliance strategy. The most recent sampling event occurred in May 2020.

The LTSP establishes four POC wells at the site for postclosure groundwater monitoring. The POC wells represent the intersection of a vertical plane with the uppermost aquifer (the middle sandstone unit of the Cedar Mountain Formation) underlying the site, which is at the hydrologic downgradient limit of the disposal cell. The LTSP included monitoring well 0172, but its construction integrity was suspect, and the well was replaced with monitoring well 0181 in 2001. It has been monitored as the replacement POC well since 2001. Table 7-2 and Figure 7-2 show the current groundwater monitoring network at the site.

Table 7-2. Groundwater Monitoring Network for the Green River, Utah, Disposal Site

Groundwater Monitoring Purpose	Monitoring Wells
POC well	0171, 0173, 0181, 0813

POC wells are sampled for nitrate, sulfate, and uranium. Groundwater monitoring results are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (<https://gems.lm.doe.gov/#site=GRN>).



Figure 7-2. Groundwater Monitoring Network at the Green River, Utah, Disposal Site

7.7.1 Water Level Monitoring

Water levels have been measured manually ever year in the POC wells since 1991. Water levels in the POC wells decreased slightly from 2017 to 2018 (Figure 7-3). Historically, the groundwater levels in these wells decreased approximately 3 ft overall from 1998 through 2004 and then increased approximately 8 ft between 2004 and 2007. Water level decreases ranged from 4 to 5 ft from 2007 through 2014. From 2014 to 2019, the water levels increased to elevations near the 2007 levels.

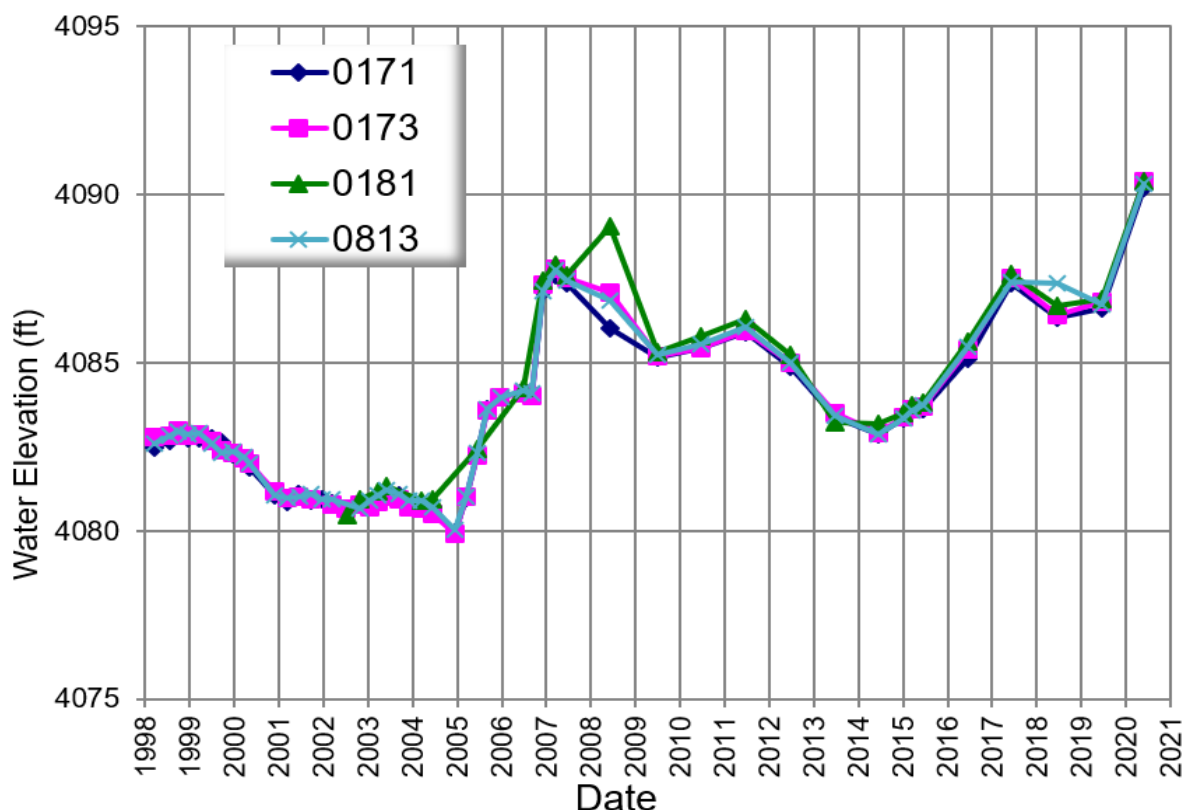


Figure 7-3. Groundwater Elevations at the Green River, Utah, Disposal Site

7.7.2 Disposal Cell Performance Monitoring

Table 7-3 presents the concentration limits for POC wells established in the LTSP. The concentration limits chosen for uranium and nitrate were the higher value from either the U.S. Environmental Protection Agency MCLs (40 CFR 192 Table 1 Subpart A) or the background concentration levels present before construction of the disposal cell (DOE 1998). The background water quality in the Cedar Mountain Formation is characterized by high total dissolved solids and concentrations of sulfate that exceed national primary and secondary drinking water regulations (DOE 1998). In accordance with the LTSP, sulfate results are compared to well-specific background concentration limits (Table 7-3). Alternate concentration limits (ACLs) are proposed as a component of the compliance strategy in the draft GCAP after it became clear that groundwater concentrations were unlikely to meet the levels specified in the

LTSP (DOE 2002). ACLs are proposed for nitrate (1000 milligrams per liter [mg/L]) and uranium (4.4 mg/L) in the draft GCAP.

Table 7-3. LTSP Concentration Limits for Point-of-Compliance Wells at the Green River, Utah, Disposal Site

Monitoring Well	Nitrate (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0171	10 ^a	3334	0.044 ^a
0173	10 ^a	4000	0.044 ^a
0181	102	4985	0.067
0813	10 ^a	4440	0.069

Note:

^a MCL (40 CFR 192 Table 1 Subpart A).

Table 7-4 provides the analytical results at the POC wells for the May 2020 sampling event. Figure 7-4 through Figure 7-6 show the time-concentration plots for nitrate, sulfate, and uranium along with corresponding MCLs.

Table 7-4. 2020 Analytical Results for Point-of-Compliance Wells at the Green River, Utah, Disposal Site

Monitoring Well	Nitrate ^a (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0171	43	3600	0.14
0173	92	7700	0.11
0181	47	6500	0.023
0813	0.056 U	3600	0.048

Notes:

^a Nitrate = nitrate plus nitrite as nitrogen.

Red = equal to or exceeding LTSP-driven concentration limit.

Abbreviation:

U = not detected

Nitrate concentrations continue to exceed the MCL in POC wells 0171, 0173, and 0181. The 2020 nitrate concentrations were within the range of historical values for all POC wells (Figure 7-4).

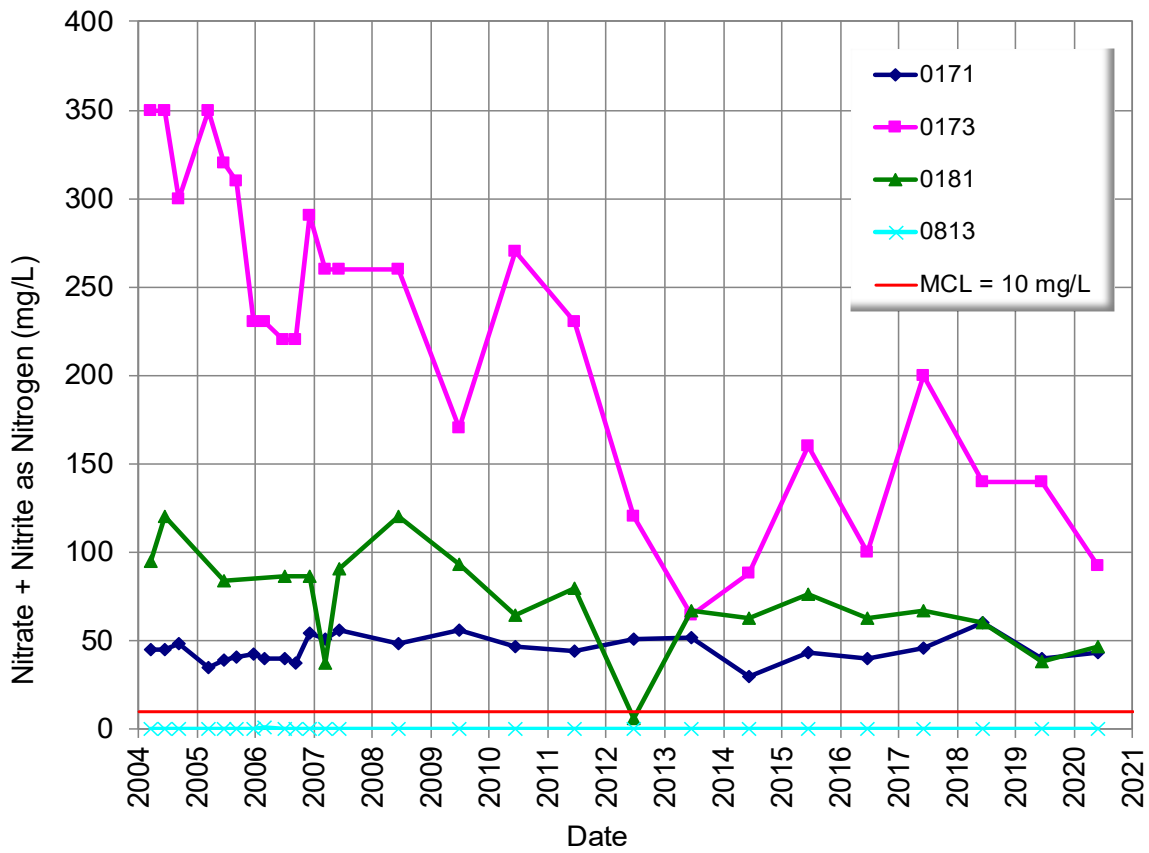


Figure 7-4. Nitrate at Point-of-Compliance Wells at the Green River, Utah, Disposal Site

Sulfate concentrations exceeded the LTSP background concentrations in all POC wells (Table 7-3) except POC well 0813. The 2020 sulfate concentrations were within the range of historical values for all POC wells (Figure 7-5).

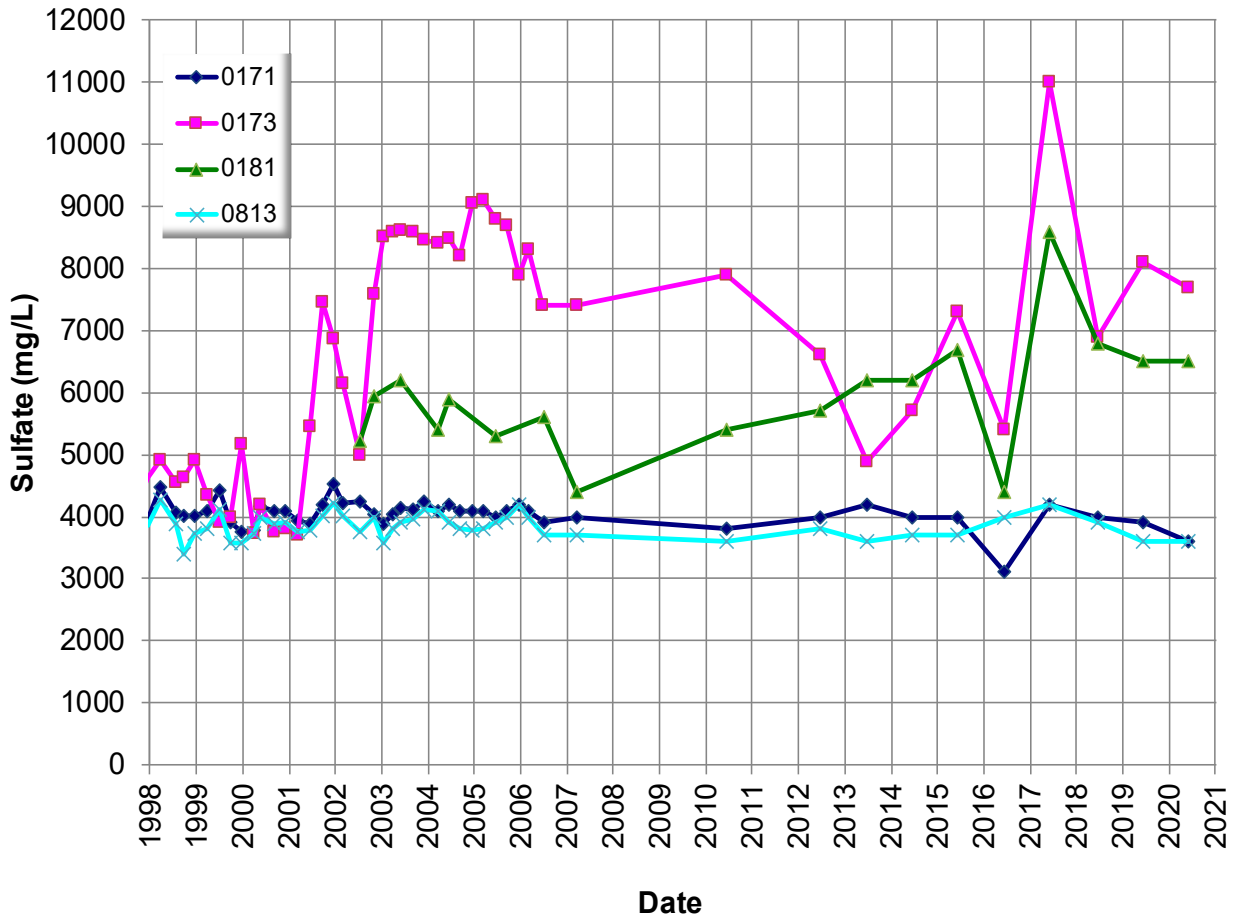


Figure 7-5. Sulfate at Point-of-Compliance Wells at the Green River, Utah, Disposal Site

Uranium concentrations in POC well 0171 routinely exceed the UMTRCA and LTSP concentration limits, while the other POCs remain mostly below the MCL. Well 0173 exceeded 0.044 mg/L in 2018 and 2020 (Figure 7-6). Well 0181 remains below the uranium concentration limit. The uranium concentration at well 0813 exceeded the standard for the first time in the 2020 event. Uranium concentrations in POC well 0171 have varied considerably, ranging from a low of 0.0184 mg/L in 1999 to a high of 0.14 mg/L in 2016. The 2020 uranium concentrations are within the range of historical values in POC wells 0171 and 0181 and exceed the highest historical values in POC wells 0173 and 0813.

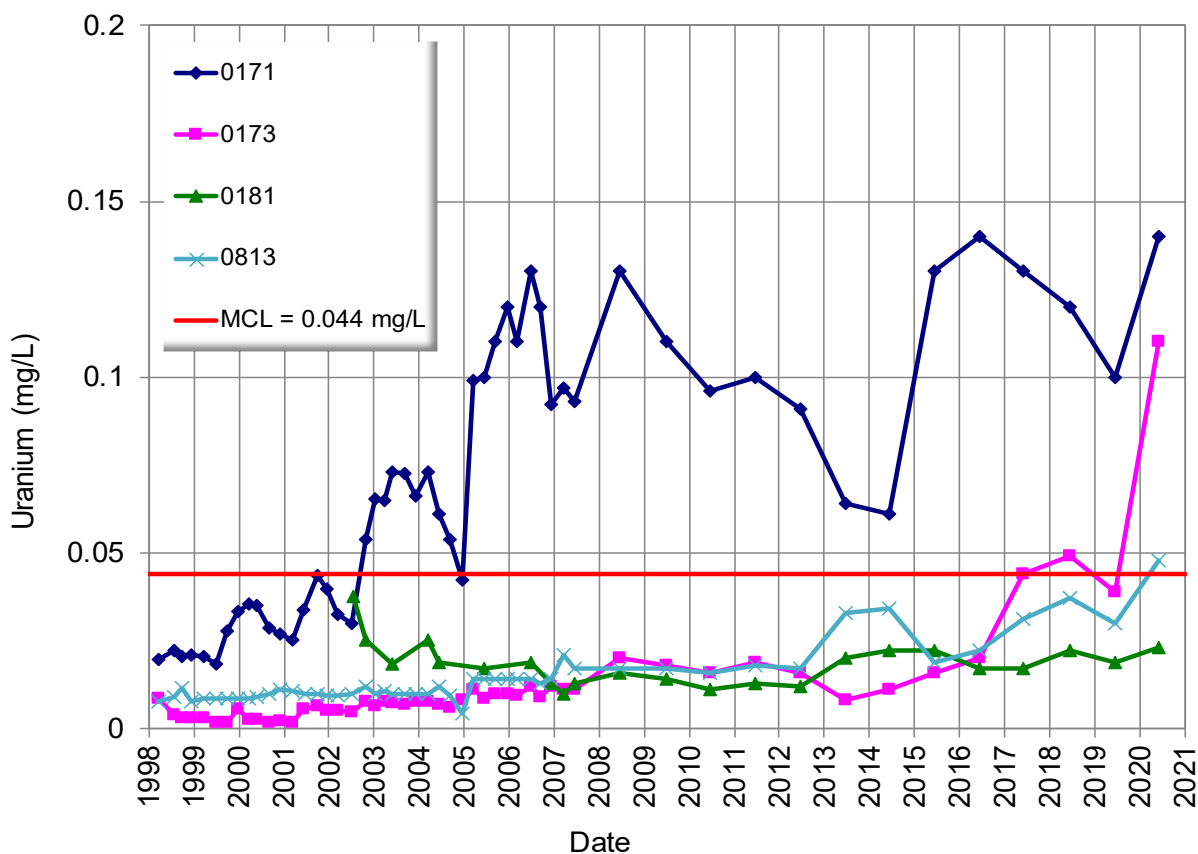


Figure 7-6. Uranium at Point-of-Compliance Wells at the Green River, Utah, Disposal Site

In summary, groundwater monitoring results were within the range of historical values at all POC wells with the exception of uranium (wells 0173 and 0813). Groundwater monitoring and disposal cell performance evaluation will continue at the site under the requirements set forth in the LTSP until the GCAP has been finalized.

7.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

7.9 References

10 CFR 40.27. U.S. Nuclear Regulatory Commission, “General License for Custody and Long-Term Care of Residual Radioactive Material Disposal Sites,” *Code of Federal Regulations*.

40 CFR 192. U.S. Environmental Protection Agency, “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings,” *Code of Federal Regulations*.

40 CFR 192 Table 1 Subpart A. U.S. Environmental Protection Agency, “Maximum Concentration of Constituents for Groundwater Protection,” *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1998. *Long-Term Surveillance Plan for the Green River, Utah, Disposal Site*, DOE/AL/62350-89, Rev. 2, July.

DOE (U.S. Department of Energy), 2002. *Final Site Observational Work Plan for the Green River, Utah, UMTRA Project Site*, GJO-2002-356-TAC, Grand Junction, Colorado, September.

DOE (U.S. Department of Energy), 2011. *Draft Groundwater Compliance Action Plan for the Green River, Utah, Disposal Site*, LMS/GRN/S07892, December.

7.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	45	Entrance Sign (Chainlink Access Gate and Disposal Cell in Background)
PL-2	135	Chainlink Security Fence
PL-3	240	Perimeter Sign P13
PL-4	—	Site Marker SMK-1
PL-5	—	Survey Monument SM-1
PL-6	220	Monitoring Wells 0194 and 0582 (with the System Operation and Analysis at Remote Sites [SOARS] Station in Background)
PL-7	315	Southwest Side Slope (and Apron) of Disposal Cell
PL-8	225	Northwest Side Slope (and Apron) of Disposal Cell
PL-9	355	Gullies Near Boundary Monument BM-8
PL-10	310	Abandoned Mill Buildings
PL-11	110	Gullies Downslope of Water Tower (Offsite)

Note:

— = Photograph taken vertically from above.



PL-1. Entrance Sign (Chainlink Access Gate and Disposal Cell in Background)



PL-2. Chainlink Security Fence



PL-3. Perimeter Sign P13



PL-4. Site Marker SMK-1



PL-5. Survey Monument SM-1



*PL-6. Monitoring Wells 0194 and 0582
(with the System Operation and Analysis at Remote Sites [SOARS] Station in Background)*



PL-7. Southwest Side Slope (and Apron) of Disposal Cell



PL-8. Northwest Side Slope (and Apron) of Disposal Cell



PL-9. Gullies Near Boundary Monument BM-8



PL-10. Abandoned Mill Buildings



PL-11. Gullies Downslope of Water Tower (Offsite)